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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/507,100	09/10/2004	Pavel Cheben	AP928USN	1797

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EXAMINER
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WALKE, AMANDA C

ART UNIT	PAPER NUMBER
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1752

DATE MAILED: 09/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/507,100

Applicant(s)

CHEBEN ET AL.

Examiner

Amanda C. Walke

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 07 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-48 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-48 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 September 2004 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-48 are rejected under 35 U.S.C. 102(b) as being anticipated by Maeda et al (2002/0004172).

Maeda et al disclose the following three types of optical recording film:

(1) an optical recording film comprising a gel having a network structure of an inorganic substance and a polymer which is from a photopolymerizable compound (A) and present in the network structure in the gel, said gel containing an optical recording-induced difference in the network structure.

(2) an optical recording film, which consists essentially of a porous gel having a network structure of an inorganic substance, the porous gel containing recording-induced porosity differences in the network structure.

(3) an optical recording film which consists essentially of a porous gel having a network structure of an inorganic substance or a gel obtained by densification of the porous gel, the porous gel or the gel having a recording-induced concavo-convex form on the surface thereof.

Specific examples of the photopolymerizable monomers include monofunctional acrylates such as tetrahydrofurfuryl acrylate, ethylcarbitol acrylate, dicylopentenylloxyethyl acrylate,

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phenylcarbitol acrylate, nonylphenoxyethyl acrylate, 2-hydroxy-3-phenoxypropyl acrylate, .omega.-hydroxyhexanoyloxyethyl acrylate, acryloyloxyethyl succinate, acryloyloxyethyl phthalate, phenyl acrylate, naphthyl acrylate, tribromophenyl acrylate, phenoxyethyl acrylate, tribromophenoxyethyl acrylate, benzyl acrylate, p-bromobenzyl acrylate, 2,2-bis(4-methacryloxyethoxy-3,5-dibromophenyl) propane, isobornyl acrylate, 2-ethylhexyl acrylate, lauryl acrylate, 2,2,3,3-tetrafluoroprop-yl acrylate and acrylsilane and methacrylates corresponding to these monofunctional acrylates; polyfunctional acrylates such as 1,6-hexanediol diacrylate, butanediol diacrylate, ethylene oxide-modified tetrabromobisphenol A diacrylate, pentaerythritol triacrylate, trimethylolpropane triacrylate and bisphenol A diacrylate and methacrylates corresponding to these polyfunctional acrylates; vinyl compounds such as styrene, p-chlorostyrene, divinylbenzene, vinyl acetate, acrylonitrile, N-vinylpyrrolidone, vinylnaphthalene, N-vinylcarbazole and vinylsilane; and allyl compounds such as diethylene glycol bisallyl carbonate, triallyl isocyanurate, diallylidene pentaerythritol, diallyl phthalate and diallyl isophthalate. Specific examples of the photoinitiator (B) include cyclic cis-.alpha.-dicarbonyl compounds such as 2,3-bornanedione (camphorquinone), 2,2,5,5-tetramethyltetrahydro-3,4-furoic acid(imidazoletrione), benzophenones such as 3,3', 4,4'-tetra-(t-butylperoxycarbonyl)benzophenone, ketones such as diacetyl, benzyl, Michler's ketone, diethoxyacetophenone, 2-hydroxy-2-methylpropiophenone and 1-hydroxycyclohexylphenylketone, peroxides such as benzoyl peroxide and di-tert-butyl peroxide, azo compounds such as allyldiazonium salt, aromatic carboxylic acids such as N-phenylglycine, xanthenes such as 2-chlorothioxanthone and 2,4-diethylthioxanthone, diallyliodonium salts,

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trialylsulfonium salts, triphenylalkyl borate, iron-allene complex, bisimidazoles, polyhalogen compounds, phenylisoxazolone, benzoin ethyl ether, benzyldimethyl ketal and mixtures of these.

The film for optical recording, provided by the present invention, may contain any one of photoinitiator aids such as amines, thiols and p-toluenesulfonic acid.

The film for optical recording, provided by the present invention, may further contain a sensitizer such as a dyestuff for causing the polymerization effectively. When visible light is used as the actinic radiation, the dyestuff is selected from those having absorption in a region of visible light. Specific examples of the dyestuff include Methylene Blue, Acridine Orange, thioflavin, ketocoumarin, Erythrosine C, Eosine Y, merocyanine, phthalocyanine and porphyrin. These dyestuffs may be used alone or in combination.

The film for optical recording, provided by the present invention, may further contain an improver (plasticizer) for improving the mobility of the photopolymerizable compound (A). The improver includes triethylene glycol dicaprylate, triethylene glycol diacetate, triethylene glycol dipropionate, glycerin tributylate, tetraethylene glycol diheptanoate, diethyl adipate, diethyl sebacate and tributyl phosphate. The amount of the improver per 100 parts by weight of the photopolymerizable compound (A) is preferably approximately 0.1 to 10 parts by weight.

The film for optical recording, provided by the present invention, preferably contains 30 to 1,000 parts by weight of the photopolymerizable compound (A) and the 0.01 to 30 parts by weight of the photoinitiator (B) per 100 parts by weight of the gel.

The above film for optical recording can be obtained by applying a composition containing the photopolymerizable compound (A), the photoinitiator (B), a metal compound (C) which is

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crosslinkable by hydrolysis when in contact with water and the subsequent polycondensation, a good solvent (D) for the above metal compound, water (E) and a catalyst (F) for the hydrolysis of the above metal compound to a substrate, and drying the coating.

The above metal compound (C) which is crosslinkable by hydrolysis when in contact with water and the subsequent polycondensation includes alkoxide, metal salts such as carboxylate, halide and nitrate, and metal complex such as acetylacetonate of silicon, titanium, zirconium or aluminum. Of these metal compounds, preferred are metal alkoxides having an alkoxy group having 1 to 4 carbon atoms such as methoxy, ethoxy, n-propoxy, iso-propoxy, n-butoxy, sec-butoxy, iso-butoxy and tert-butoxy.

[0052] Specific examples of the metal alkoxide preferably include tetraethoxysilane, tetramethoxysilane, tetrabutoxysilane, titanium tetraisopropoxide, titanium tetrabutoxide, zirconium tetramethoxide, zirconium tetrabutoxide, aluminum triethoxide and aluminum triethoxide. These metal alkoxides may be used alone or in combination.

A silicon compound having a group which reacts with the hydrolyzate from the metal compound (C) to allow a straight molecular chain to bond to the gel may be used in combination with the metal compound (C). The silicon compound includes silanol-terminated polydialkylsiloxane, epoxysilane and aminosilane. The silicon compound bonds to the gel formed from the metal compound (C) to impart the gel with flexibility. The amount of the silicon compound based on the metal compound (C) is preferably 50% by weight or less, more preferably 30% by weight or less.

Given the teachings of the reference, the instant claims are anticipated.

3. Claims 1-48 are rejected under 35 U.S.C. 102(b) as being anticipated by Chandross et al (EP 938027 or 6,268,089).

Chandross et al disclose an improved photorecording medium suitable for use in holographic storage systems contains a glassy hybrid inorganic-organic, three dimensional matrix, in which is distributed a photoimageable system comprising one or more photoactive, organic monomers. The medium is fabricated by providing a precursor of the hybrid inorganic-organic matrix, mixing the matrix precursor with the photoimageable system, and curing the matrix precursor to form the matrix in situ. The matrix and photoimageable system exhibit independent chemistries, such that the step of matrix formation does not substantially affect the photoimageable system. The hybrid matrix precursor is typically an oligomer derived from a compound represented by  $R_n M(OR')_{4-n}$ , where M is a metallic element having a valence of three or higher, such as silicon, titanium, germanium, zirconium, vanadium, or aluminum, R is an alkyl or aryl, R' is a lower alkyl, and n ranges from 1 to 2. The hybrid nature of the matrix material provides several advantages. The inorganic character offers thermal, mechanical, and chemical stability, and also reduces both the bulk viscoelastic creep and the bulk polymerization-induced shrinkage typically exhibited by media utilizing organic polymer matrices. The organic character provides compatibility between the matrix precursor and the organic components (e.g., the photoactive monomer) of the photoimageable system, allowing homogeneous mixing during fabrication of the medium. The organic moieties also offer some flexibility to the matrix, and, it appears, ease diffusion of the photoactive monomer within the matrix during exposure, thereby improving the process of storing data. The hybrid nature of the matrix material provides several

advantages. The inorganic backbone offers thermal, mechanical, and chemical stability. The inorganic backbone also reduces both the bulk viscoelastic creep and the bulk polymerization-induced shrinkage typically exhibited by media utilizing organic polymer matrices. The organic moieties attached to the backbone provide compatibility between the matrix precursor and the organic components (e.g., the photoactive monomer) of the photoimageable system, allowing desirable dispersion of the photoimageable system in the matrix precursor during fabrication of the medium. In addition, larger organic moieties, e.g., aryls, provide increased free volume and reduced network density in the matrix. Such lowered network density appears to ease diffusion of the monomer within the matrix during exposure, thereby improving the process of storing data. In addition, selection of the organic moieties allows adjustments to the physical properties of the matrix. The hybrid matrix precursor is typically an oligomer derived from a compound represented by  $R_n M(OR')^{4-n}$ , where M is a metallic element that has a valence of three or higher, e.g., silicon, titanium, germanium, zirconium, vanadium, and aluminum (silicon is considered a metallic element for purposes of the invention), R is an alkyl or aryl, such as methyl or phenyl, R' is a lower alkyl with up to 4 carbon atoms, and n ranges from 1 to 2. At least a portion of the precursor should be trifunctional ( $n=1$ ) to provide a three-dimensional matrix structure. It is possible to obtain oligomeric precursors commercially, particularly siloxane oligomers. Alternatively, it is possible to obtain monomeric precursor, in which case the associated oligomer is formed at some point prior to the process of fabricating the photorecording medium--typically before mixing of the precursor with the photoimageable system. Obtaining or forming an oligomeric precursor prior to mixing with the photoimageable system allows a milder final cure, thereby reducing the likelihood of premature polymerization



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of the photoactive monomer. The photoimageable system contains a photoactive organic monomer, which is induced to polymerize upon exposure of the photoimageable system to light that has passed through an array representing a page of data. In response to the lesser amounts of monomer in the irradiated regions caused by the polymerization, additional monomer diffuses from the dark to the exposed regions. The polymerization and resulting monomer concentration differences create a refractive index change, thereby forming a hologram of the data carried by the recording light. A variety of useful monomers, typically referred to as photomonomers, are known in the art and are useful in the invention. See, e.g., U.S. patent application Ser. No. 08/698,142, and W. K. Smothers et al., "Photopolymers for Holography," SPIE OE/Laser Conference, 1212-03, Los Angeles, Calif., 1990, both referenced previously. In selecting a photomonomer, considerations include the monomer's refractive index, particularly the contrast between the monomer's refractive index and the matrix's refractive index, as well as the rate of reactivity of the monomer. Monomers suitable for the medium of the invention include acrylate monomers, such as isobomyl acrylate, phenoxyethyl acrylate, and diethylene glycol monoethyl ether acrylate. Monomers having other functional groups, such as epoxides and vinyl ethers, are also suitable. It is possible to use a monomer that enhances the contrast between exposed and non-exposed portions of the medium. These contrast-enhancing monomers include acrylates such as 2-naphthyl-1-oxyethyl acrylate and 2(N-carbazoyl-1-oxyethyl) acrylate. It is also possible to use monomers which exhibit a relatively low refractive index, e.g., less than 1.50. A mixture of monomers is useful in some situations to provide desired properties. In an advantageous embodiment, the hybrid matrix precursor is an organosiloxane oligomer derived from hydrolysis and condensation of one or more trifunctional organoalkoxysilanes, e.g., triethoxysilanes.

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Particularly useful trifunctional organoalkoxysilanes include methyltriethoxysilane, phenyltriethoxysilane, and mixtures of both methyltriethoxysilane and phenyltriethoxysilane. It is also possible to include some difunctional organoalkoxysilanes, e.g., dialkoxysilanes, to provide desired physical properties. In particular, the presence of the difunctional organoalkoxysilanes reduces the cross-link density in the matrix, thereby, it is believed, enhancing diffusion of the photoactive monomer in the medium. Formation of oligomeric precursor is accomplished by hydrolysis and condensation, thereby forming a branch siloxane ladder network. This oligomer formation step is typically carried out before the pre-cure, and a variety of such oligomeric materials are commercially available. As discussed previously, the organic moieties enhance the solubility of the photoactive organic monomer in the precursor, and also impart some flexibility to the final siloxane matrix. It is possible to commercially obtain organoalkoxysilanes as partially hydrolyzed organosiloxane oligomer, as either a liquid or a solid form known as flake.

Given the teachings of the references, the instant claims are anticipated.

### *Conclusion*

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Wei et al (6,277,304), Geiter et al (6,632,897), Cheben et al (2005/0161645), Belleville et al (6,579,477), Zhang et al (2002/0123592), De et al (6,610,808, 6,924,339), and Koloski et al (5,977,241, 6,548,590, 6,608,129) are cited for their teachings of similar materials.


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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amanda C. Walke whose telephone number is 571-272-1337.

The examiner can normally be reached on M-R 5:30-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Amanda C Walke  
Examiner  
Art Unit 1752

ACW  
September 26, 2005